LIVERMORE LAB REPORT

A weekly compendium of media reports on science and technology achievements at Lawrence Livermore National Laboratory, July 21-25. Though the Laboratory reviews items for overall accuracy, the reporting organizations are responsible for the content in the links below.

Los Angeles Times

EXTREME CRUSH

The interior of the target chamber at the National Ignition Facility at Lawrence Livermore. The object entering from the left is the target positioner, on which a millimeter-scale target is mounted. Researchers recently used NIF to study the interior state of giant planets.

Lawrence Livermore scientists are trying to determine what happens to matter when it is exposed to the immense pressures at the center of gas giant planets and stars. And to help them figure it out, they have hit a tiny sliver of a diamond with the largest laser system on Earth.

"The goal of the shots is to try and create planetary core conditions on Earth," said Ray Smith, a physicist at Lawrence Livermore. "And by that I mean very high pressure and relatively low temperature."

Up until 15 years ago, it was expected that if you compressed materials to very high pressures they would behave in a manner very easy to understand, Smith explained. The general thinking was that if you imagine atoms as balls, those balls would simply get closer together at very high pressures.

The theoretical consensus is that matter behaves in a much more complicated way at high pressures -- but there haven't been experiments that can back those theoretical predictions until now. For the first time, Smith and his colleagues have been able to simulate here on Earth the pressure you might find at the center of Saturn.

To read more, go to the *Los Angeles Times*.

USA TODAY SCIENCE ON THE BRAIN

Lawrence Livermore engineers Angela Tooker and Vanessa Tolosa load silicon wafers into a metal deposition chamber during the development of neural devices.

Lawrence Livermore scientists are developing a brain implant that might one day reverse memory loss from traumatic brain injuries, Alzheimer's disease and epilepsy.

The research builds on the understanding that memory is a process in which neurons in certain regions of the brain encode information, store it and retrieve it. The device is envisioned as a wireless, implantable neuroprosthetic for patients with brain injuries and dysfunction.

The Defense Advanced Research Projects Agency awarded LLNL $2.5 million to develop the implantable device.

To read more, go to *USA Today*.

SPACE DAILY
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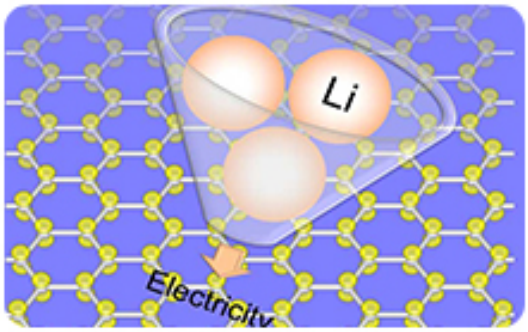
GETTING MORE LIFE FROM LITHIUM-ION BATTERIES



New work by scientists at Lawrence Livermore and Rice University details the binding properties of lithium ions to various types of carbon that may be used for lithium-ion batteries. Credit: Yuanyue Liu/Rice University

Your cellphone may stay charged longer due to advances in modeling lithium-ion battery storage capacity.

New research indicates that lithium-ion batteries could benefit from a theoretical model created at Lawrence Livermore and Rice University that predicts how carbon components will perform as electrodes.

The growing demand for energy storage emphasizes the need for higher-performance batteries. Several key characteristics of lithium-ion battery performance -- capacity, voltage and energy density -- are ultimately determined by the binding between lithium ions and the electrode material. Yet subtle changes in the structure, chemistry and shape of an electrode can significantly affect how strongly lithium ions bond to it, in a way researchers don't fully understand.

The new model predicts the strength of this binding based on intrinsic characteristics of carbon materials used as battery anodes.

To read more, go to *Space Daily*.

PHYS.ORG
BRINGING NEW LIFE TO LICK

Lick Observatory's Laser Guide Star forms a beam of glowing atmospheric sodium ions. This helps astronomers account for distortions caused by the Earth's atmosphere so they can see further and more clearly into space. Photo by Laurie Hatch/lauriehatch.com

Earlier this year, engineering technical associate Pam Danforth of Lawrence Livermore applied 30 years of laser experience to an out-of-this-world problem – bringing new life to the University of California's Lick Observatory Laser Guide Star.

The Laser Guide Star is vital to astronomers because a natural star isn't always near an object they want to observe. By training the guide star beam into the sky near such an object, an artificial guide star of glowing atmospheric sodium ions is created, allowing the laser guide star to function like a natural star and provide correct focus for the object they want to observe.

The Laser Guide Star was a spinoff technology from LLNL's Atomic Vapor Laser Isotope Separation (AVLIS) program, a project Danforth worked on for nearly 20 years. Her specialty was the program's dye master oscillator, which provides precise laser frequency and pulse length for the dye amplifiers.

To read more, go to Phys.org.

Lawrence Livermore researcher Brandon Wood and his colleagues have received $1.2 million to help improve vehicle hydrogen storage.

Researchers at Lawrence Livermore plan to use nanoparticles to increase the onboard storage capacity of hydrogen-powered vehicles.

Using $1.2 million from the Department of Energy's Office of Energy Efficiency and Renewable Energy over three years, LLNL scientist Brandon Wood said that through theory and modeling, his team will tackle the existing kinetic limitations when it comes to making the most efficient nanoparticles for onboard hydrogen storage.

Wood and colleague Tae Wook Heo will use multiscale modeling to investigate the kinetics of a high-capacity hydrogen-storage candidates based on nanoparticles of magnesium borohydride for light-duty vehicles.

Unlike conventional hydrogen storage tanks, the new tank would be much smaller and would not require the hydrogen to be stored at cryogenic temperatures.

To read more, go to *Daily Fusion*.
